T R A N S L A T I O N

(19) JAPANESE PATENT OFFICE (JP)

Official Gazette for Unexamined Patent (A)

[11] Japanese Patent Application Publication Kokai S48-98121

[43] Publication Date: December 13, 1973

[21] Application Number: S47-31637

[22] Application Date: March 31, 1972

Request for Examination: Yes

(Total of 4 pages)

Office Reference No.
6845 47
7030 35

52. Japan Class
42 DO
126 C102

Application for Patent (3)

March 31, 1972

To Commissioner of the Japanese Patent Office

1. Title of Invention
Novel Synthetic fibers for fiberfill

2. Inventors
N. Ohshima, 1415 Tsutsui, Masaki-cho, Iyogun, Ehimeken
S. Sugihara, 1415 Tsutsui, Masaki-cho, Iyogun, Ehimeken
H. Kitagawa, 1415 Tsutsui, Masaki-cho, Iyogun, Ehimeken

3. Applicant
(315) Toray KK, 2-2 Nihonbashi-muromachi, Chuo-ku, Tokyo
CEO, T. Fujiyoshi

4. Agent
(6503)
I. Shinoda, c/o Toray KK, 2-2 Nihonbashi-muromachi, Chuo-ku, Tokyo
CEO T. Fujiyoshi

5. List of Attachments

(1)	Specification	1 copy
(2)	Carbon Copy of Application	1 copy
(3)	Power of Attorney	1 copy
(4)	Drawings	1 copy

SPECIFICATION

1. Title of Invention

Novel synthetic fibers for fiberfills

2. Novel synthetic fibers for fiberfill comprised of a flat conjugate fiber the cross-section of which is split in the [longitudinal] fiber axis direction by at least 2 components wherein the degree of flatness is 13-25, the denier is 12-15d, and crimps are 5-15 crimps/25mm.

3. Detailed Description of the Invention

The present invention relates to a novel synthetic fiber for fiberfill. It further relates to a synthetic fiber that is suitable for stuffing material, particularly for fiberfill in bedding comforters, pillows, and cushions.

In general, a large number of natural and synthetic fibers such as cotton, polyester, polyamide, polyacryonitrile, polypropylene, and the like, have been applied as fiberfill materials; in particular, synthetic fibers have been preferred fiberfill, in view of their lighter than cotton weight and rich bulkiness because the synthetic fibers enables one to artificially vary the fiber denier and crimp configuration and because of the fact that the production of fibers with 3-dimensional crimps have been made possible for conjugated fibers by advances in technology.

However, it is also undeniable that such bedding material is still inferior to feather bedding comforters considered heretofore to be the highest class material, in terms of comforter feel, compliance along the skin, and bulkiness retention, and so on,

The present invention was arrived at as a result of extensive studies by the present inventors on synthetic fiber-based fiberfill, in order to maintain the advantages of the lightness and bulkiness as described above, and at the same time, to incorporate the feel and hand such as compliance along the skin etc. as is provided by feather comforter bedding materials.

That is, the present invention relates to novel synthetic fibers for fiberfill comprised of a flat conjugate fiber the cross-section of which is split in the [longitudinal] fiber axis direction by at least 2 components

wherein the degree of flatness is 13-25, the denier is 12-15d, and crimps are 5-15 crimps/25mm.

The synthetic fibers in this invention include all fibers manufactured by the usual spinning technologies such as melt-spinning, dry-spinning, wet-spinning, or the like from artificially synthesized and fiber-forming capable polymers such as polyesters, polyamides, polyacryonitrile, polyolefins from polymers, in particular, preferably polyester fibers, which are outstanding in performance as fiberfill.

Said fiber is a conjugate fiber which has a flat cross-section in which the cross-section in the fiber axis direction is split by at least 2 components, that is, a flat shaped conjugate fiber with the conjugating components being conjugated in a specific way. This is based on the novel finding that among the flat conjugate fibers known in the art obtained by conjugating at least 2 components having a difference in the degree of polymerization or viscosity at any boundary surface, except for those having boundary surfaces in the fiber direction in the cross-section, the resultant spun yarns get twisted making the way the spinning is carried out extremely unstable, in addition, substantially reducing the capability of developing crimps as an assembled fiber material. However, fibers formed by conjugation at any arbitrary boundary surface may be acceptable to some extent in actual commercial production. It is further necessary for the above flat conjugate fiber to have the fiber flatness, denier, and crimp remain within specific ranges for use as fiberfill.

That is, the invention requires the cross-sectional shape of the fiber to have a flatness of 1.3-2.5, preferably 1.5-2.0. A level of flatness lower than 1.3 shows no substantial improvement in hand compared to circular cross-sectional fibers while a level higher than 2.5 will reduce the capability of developing crimps as an assembled fiber material, which will result in reduced bulkiness and will not be preferred in terms of hand. The degree of flatness is a measure introduced herein to specifically express the cross-sectional configuration of a flat conjugate fiber, as illustrated by Figure 1a-c, which is expressed as L/W, the ratio of the longest axis (L) in the fiber direction to the longest axis (W) in the transverse direction at a right angle to the fiber axis in Figure 2. In terms of denier, the fiber should be 2-15d, preferably 4-6d. A level of denier less than 2d will cause the formation of pilling on the surface of the backing when used as a comforter material where said fiber migrates through the backing material, while fibers exceeding 15d will give a fiberfill with improved toughness, resiliency, but will remove the inherent softness afforded by a flat conjugate fiber.

With respect to crimps, the invention requires the fiber to have 5-15 crimps, preferably 7-12 crimps/25mm. If the number of crimps is outside of the

range 5-15 crimps/25mm, this will not only result in low bulkiness, but also will cause a shortage or excess in the entanglements of fibers with each other, resulting in fleece breakage or frequent occurrence of neps and the like, in a carding machine treatment.

The above-described fiber may be manufactured by any selected known conjugate fiber spinning process as long as the fiber satisfies the required ranges specified in the invention. The degree of flatness is selected normally on the #= bases of polymer composition, spinneret orifice configuration, spinning conditions, and the like; crimps are generally developed by spinning under a suitable control of the differences in the degree of polymerization, the differences in viscosity, or the differences in chemical composition between the conjugate components, resulting in a difference in thermal shrinkage; this is followed by drawing and cutting into the desired length, applying a heat treatment under a relaxed state, thereby developing the desired crimps, where a mechanical crimp formation can also be used in combination therewith. In order for the fibers to maintain a suitable hand as a fiberfill, it will be effective to use a highly smooth oiling agent or a surface treatment involving polyfluoro-ethylene resin and the like.

As described above, the present invention is featured by use of a flat conjugate fiber which has specific way of conjugating the conjugating components as a novel synthetic fiber for fiberfill, in addition, by the degree of flatness, denier, and crimp being regulated; the fiber of this invention will provide a fiberfill having not only lighter and richer bulkiness than those conventionally available, but also excellent hand with a feather bedding-like touch and conformity along the skin and the like.

The present invention is now specifically explained by the following Examples. In these Examples, denier and crimp properties were measured in accordance with the JIS. The bulkiness characteristic was measured by the following method:

The fiber is opened by passing it through the usual carding machine followed by laying it down to give a 10g web layer having an area of 10 x 10cm. On this web is applied a 5g/cm^2 weight load for 10 seconds, followed by removing the load, and letting it stand for 5 seconds. This operation is repeated 3 times and then a 1g/ cm^2 load is added, and the sample is left standing for 1 minute, and then the height (A) is measured from which the bulkiness (cm^3/g) is calculated. Then a 10g/cm^2 load is added and is left standing for 1 minute whereupon the height (B) is measured. Then the load is immediately removed and then a 1g/cm^2 load is added and the sample is left standing for 1 minute at which time the height C is measured, from which the percent compression and percent recovery are calculated by the following equations:

Compression(%)=(A-B)/A x 100

Recovery(%)= (C-B)/(A-B) x 100

Example 1

A drawn yarn was prepared from polyethylene terephthalate conjugating components having inherent viscosities 0.66 and 0.56 (measured in orthochlorophenol at 25°C) using a conjugate spinning spinneret, disclosed in Japanese Patent Application Publication S39-26142, by the usual spinning and drawing methods except for the other conditions that are given in Table 1. The drawn yarn was then cut into the desired fiber length and heat treated under relaxation at 140°C to develop crimps. The results are given in Table 1.

	Fiber Type	A (Present Invention)	B (Comparative Product)
Spinning Conditions	Spinneret Configuration		
	How Conjugated		
	Conjugation Ratio	1:1	1:1
Fiber Properties	L/W (-)	1.6	1.0
	Tenacity (g/d)	5.15	5.24
	Elongation (%)	40.2	39.7
	Number of Crimps (/25mm)	10.4	10.3
	Degree of Crimp formation (%)	22.4	23.4
	Residual Crimp (%)	17.9	17.8
	Crimp Resiliency (%)	80.3	84.0
	Denier (-)	4.0	4.0
	Fiber Length (mm)	75	75
Bulk Characteristics	Bulkiness (cm^3/g)	91	91
	Percent Compression (%)	63	50
	Percent Recovery (%)	79	80

The fiber was then made into a fiberfill using a conventional carding machine from which a 150 x 200cm bedding comforter (1.5kg filled) was prepared, on which a sensory test was carried out: the comforter using fiber A (present invention) had a much softer hand and better bulkiness and better fits and more warmth and lighter feel compared to the comforter using fiber (B) (comparative example), thereby showing very favorable properties as a comforter with this invention.

Example 2

A variety of fibers C-I shown in Table 2 were prepared according to the procedure of Fiber A of Example 1. The degree of flatness was varied by controlling the spinneret shape, L/W, and the spinning temperature chimney airflow rate by any desired control method.

Table 2

		C	D	E	F	G	H	I
Fiber Properties	L/W	1.2	1.4	1.6	2.1	2.4	2.6	2.8
	Denier	5.7	5.6	5.7	5.7	5.8	5.7	5.8
	No. of Crimps (Crimps/25mm)	10.6	10.8	10.5	10.1	10.3	10.8	8.4
	Percent Crimping (%)	16.1	15.2	15.0	14.1	14.1	13.1	10.2
	Percent Residual Crimps(%)	13.2	12.2	11.6	11.0	10.9	10.2	8.6
	Crimp resiliency Percent(%)	82.0	80.3	77.3	78.0	77.4	77.9	84.3
Bulkiness Characteristics	Bulkiness (cm^3/g)	91	85	81	84	82	75	67
	Percent Compression (%)	39	43	46	51	49	52	61
	Percent Recovery (%)	92	92	89	88	87	87	86

These fibers C-I were used to prepare fiberfill as in Example 1 from which a 150 x 200mm upper comforter was prepared by the usual method. According to a sensory test of such comforters, C with L/W of 1.2 showed better bulkiness but a harder hand, while the sample with L/W of 2.6 or greater (H and I) gave a low bulk and a hand feeling d as if the fibers themselves were stuck to each other because their ability to develop crimp formation by heat treatment as an assembled fiber was inferior.

On the other hand, samples with L/W, 1.3-2.5 (D, E, F, and G: (the present invention) showed good bulkiness and hand as well as good conformity along the skin, showing superior fiberfill not only compared to the conventional circular shaped cross-sectional fibers, but also compared to C, H, or I.

4. Brief Description of the Drawing

Figures 1(a-c) illustrate the cross-sections of the flat conjugate fibers and the way the conjugating components were conjugated.

Figure 2 illustrates the degree of flatness (L/W) of the flat conjugate fibers.

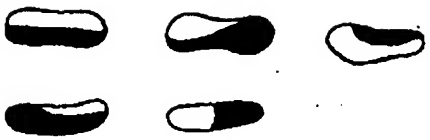

Fig. 1

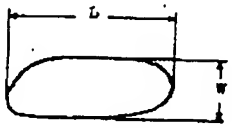

Fig. 2

Transl: Language Services
Chemical Japanese Services
January 25, 2001/chu